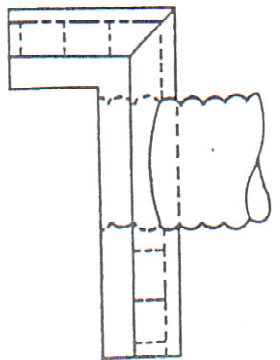


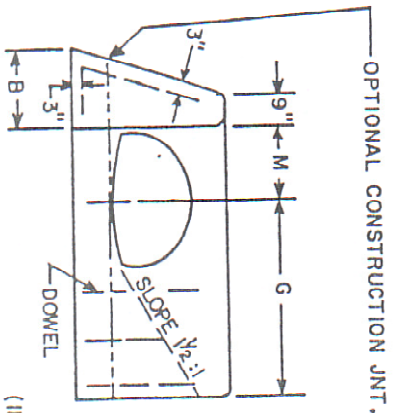
ENDWALLS AND RETAINING WALLS



PLAN

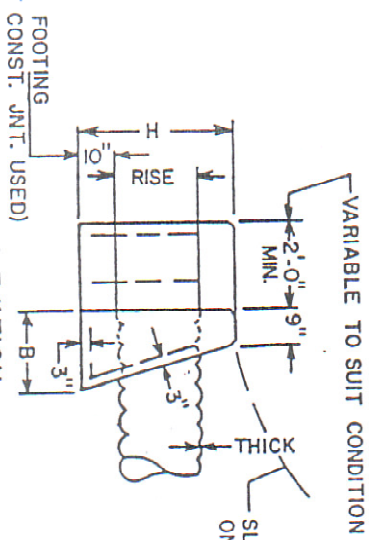
GENERAL NOTES:

- ALL CORNERS TO BE CHAMFERED 1".
- THE CONTRACTOR WILL BE REQUIRED TO PLACE 2-#6 BARS "Y" IN THE TOP OF ALL ENDWALLS FOR PIPE CULVERTS 42" AND OVER WITH A MINIMUM 3" COVER AND A LENGTH 6" LESS THAN ENDWALL.
- IF CONTRACTOR ELECTS TO USE CONSTRUCTION JOINT AT BOTTOM OF PIPE, BAR "X" (DOWELS) SHALL BE IN THE BASE AS SHOWN ON PLANS. SPACING TO BE APPROXIMATELY 12" CENTERS UNLESS ENGINEER DIRECTS OTHERWISE.
- WHEN CONTRACTOR ELECTS TO USE CONSTRUCTION JOINT AT BOTTOM OF PIPE AND POURS BASE SEPARATELY, THE TOP OF THE BASE SHALL BE LEFT ROUGH.
- FORMS WILL BE USED IN CONSTRUCTION OF BOTTOM SLAB.
- CLASS "AA" CONCRETE SHALL BE USED.



OPTIONAL CONSTRUCTION JNT.

ELEVATION



VARIABLE TO SUIT CONDITION

END ELEVATION

QUANTITIES BASED ON 2'-0"

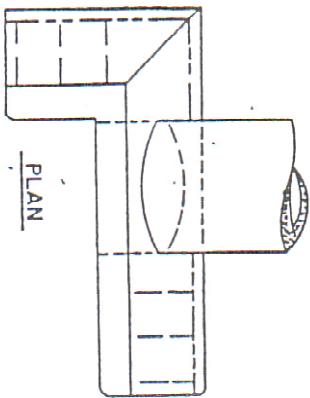
REINFORCING QUANTITIES												
SPAN	18"	22"	25"	29"	36"	43"	50"	68"	65"	72"		
BAR	X	X	X	X	X	X	X	X	X	X		
QTY.	5	5	5	6	7	7	7	8	8	8		
LBS.	12	12	12	14	14	16	16	16	19	19		

DIMENSIONS AND CONCRETE QUANTITIES									
COMMON DIMENSIONS USING C.M. ARCH PIPE									
SPAN	RISE	THICK	H	B	G	M	TOTAL CONC.		
18"	11"	.064	2'-7"	1'-4"	2'-5"	1'-0"	0.604		
22"	13"	.064	2'-9"	1'-5"	2'-9"	1'-2"	0.712		
25"	16"	.064	3'-0"	1'-6"	3'-3"	1'-4"	0.877		
29"	18"	.079	3'-2"	1'-7"	3'-7"	1'-6"	1.015		
36"	22"	.079	3'-6"	1'-9"	4'-3"	1'-9"	1.306		
43"	27"	.079	3'-11"	2'-0"	5'-1"	2'-1"	1.796		
50"	31"	.109	4'-3"	2'-2"	5'-9"	2'-4"	2.206		
58"	36"	.109	4'-8"	2'-4"	6'-7"	2'-8"	2.794		
65"	40"	.138	5'-0"	2'-6"	7'-4"	3'-0"	3.387		
72"	44"	.138	5'-4"	2'-8"	8'-0"	3'-3"	3.995		

APPROVED: DATE May 8, 1980

STANDARD CONCRETE "L" ENDWALL FOR SINGLE PIPE CULVERTS
18" THRU 72" ARCH PIPE
CITY OF GREENVILLE, N.C.—ENGINEERING DEPT.

STD. NO.	REV.
30.01	



GENERAL NOTES:

ALL CORNERS TO BE CHAMFERED 1".

THE CONTRACTOR WILL BE REQUIRED TO PLACE 2-#6 BARS "Y" IN TOP OF ALL ENDWALLS FOR PIPE CULVERTS 42" AND OVER WITH A MIN. OF 3" COVER AND A LENGTH OF 6" LESS THAN ENDWALL.

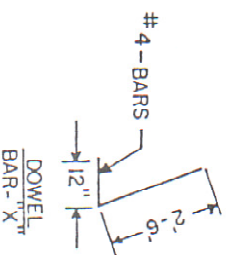
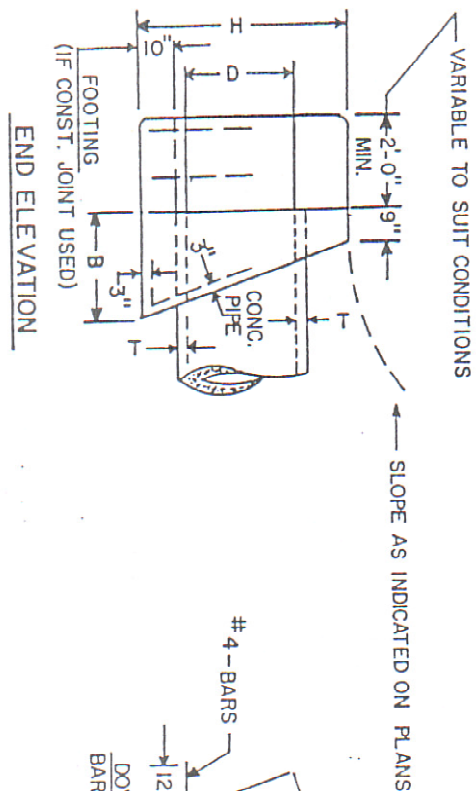
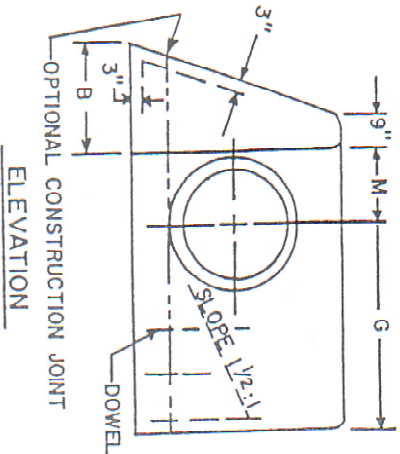
IF CONTRACTOR ELECTS TO USE CONSTRUCTION JOINT AT BOTTOM OF PIPE, BAR "X" (DOWELS) SHALL BE PLACED IN THE BASE AS SHOWN ON PLANS. SPACING OF BARS TO BE ON APPROXIMATELY 12" CENTERS UNLESS ENGINEER DIRECTS OTHERWISE.

IF THE CONTRACTOR ELECTS TO USE CONSTRUCTION JOINT AT BOTTOM OF PIPE AND POUR SLAB SEPARATELY, THE TOP OF BASE SHALL BE LEFT ROUGH.

FORMS ARE TO BE USED FOR THE CONSTRUCTION OF BASE SLAB.

WALL THICKNESS (T) SHOWN IS NOT TO BE INTERPRETTED TO MEAN THE THICKNESS ACCEPTABLE, BUT ARE USED ONLY IN COMPUTATIONS OF ENDWALL QUANTITIES.

CLASS "A" CONCRETE SHALL BE USED.



REINFORCING QUANTITIES											
DIA.	15"	18"	24"	30"	36"	42"	48"	48"	48"	48"	48"
BARS	X	X	X	X	X	X	X	X	X	X	X
QTY.	5	5	6	6	7	7	2	7	2	8	2
LBS.	12	12	14	14	16	47	49	52	55		

COMMON DIMENSIONS AND CONCRETE QUANTITIES											
COMMON DIMENSIONS						COMMON DIMENSIONS					
D	H	B	G	M	T	CUL YD.	H	B	G	M	CUL YD.
15"	3'-4"	1'-8"	2'-9"	1'-0"	17/8"	0.960	3'-0"	1'-6"	2'-6"	0'-11"	0.770
18"	3'-4"	1'-8"	2'-9"	1'-0"	17/8"	0.960	3'-0"	1'-6"	2'-6"	0'-11"	0.770
24"	3'-7"	1'-10"	3'-2"	1'-2"	2"	1.193	3'-3"	1'-8"	2'-11"	1'-0"	0.964
30"	4'-2"	2'-1"	4'-0"	1'-5"	2 1/2"	1.711	3'-9"	1'-11"	3'-8"	1'-3"	1.385
36"	4'-9"	2'-5"	4'-7"	1'-9"	2 3/4"	2.394	4'-3"	2'-2"	4'-5"	1'-6"	1.908
42"	5'-3"	2'-8"	5'-6"	2'-0"	3"	3.169	4'-9"	2'-5"	5'-2"	1'-9"	2.544
48"	5'-10"	2'-11"	6'-4"	2'-4"	3 1/2"	4.139	5'-3"	2'-8"	5'-11"	2'-0"	3.301
48"	6'-5"	3'-3"	7'-2"	2'-8"	4"	5.422	5'-9"	2'-11"	6'-8"	2'-3"	4.193

NO.	DATE	DESCRIPTION

STANDARD CONCRETE "L" ENDWALL FOR SINGLE PIPE CULVERTS
15" THRU 48" PIPE

CITY OF GREENVILLE, N.C.—ENGINEERING DEPT.

STD. NO. 30.02
REV.

APPROVED: DATE May 8, 1980

GENERAL NOTES:

All corners are to be chamfered 1".

The Contractor will be required to place 2-6 bars "Y" in the top of all endwalls for pipe culverts 42" and over with a minimum of 3" cover and a length of 6" less than endwall.

Forms are to be used for construction of bottom slab.

Wall thickness (T) shown is not to be interpreted to mean the thickness acceptable, but is used only in computing endwall quantities.

If contractor elects to use construction joint at bottom of pipe and pours base separately, the top of the base shall be left rough.

When contractor elects to use construction joint at bottom of pipe, bar "X" (dowels) shall be placed in the base as shown on plans, spacing of bars to be approximately 12" centers unless engineers direct otherwise.

When skew angle of pipe is over 45°, use G-1 dimension for 45° plus 6" for each 5° over 45°, G2 dimension will be the new dimension divided by the cosine of the angle of pipe skew.

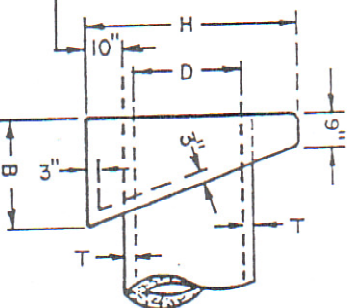
Class "AA" concrete shall be used.

All pipes will meet NCDOT-Division of Highways specifications for load bearing capacities.

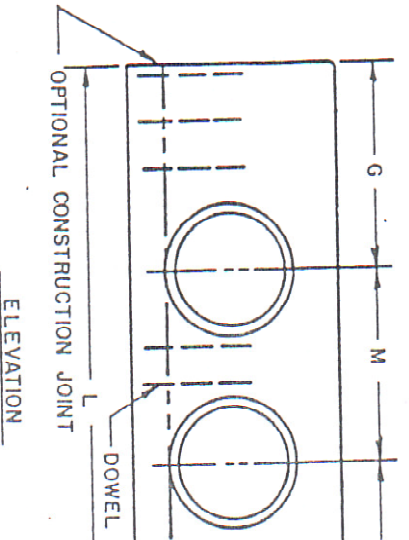
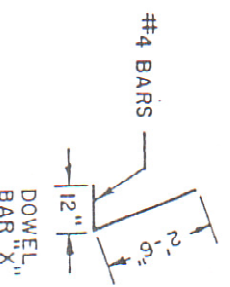
REVISIONS

NO.	DATE	DESCRIPTION

APPROVED: DATE May 8, 1980

FOOTING
(IF CONST JOINT USED)

END ELEVATION



ELEVATION

DOWELS IN ENDWALL WITH REINFORCED CONC. PIPE																
PIPE DIA.	SINGLE PIPE								DOUBLE PIPE							
	15"	18"	24"	30"	36"	42"	48"	54"	15"	18"	24"	30"	36"	42"	48"	54"
C. BARS	x	x	x	x	x	x	y*	x	y*	x	x	x	x	x	y	x
G QTY.	2	2	3	3	4	4	5	5	2	2	3	3	4	4	5	5
M QTY.	-	-	-	-	-	-	2	2	1	2	2	2	2	2	3	2
G QTY.	2	2	3	3	4	4	5	5	2	2	3	3	4	4	5	5
TOT. LBS.	9	9	14	14	19	25	35	45	12	12	19	19	23	27	32	32

SEE NOTE

DOWELS IN ENDWALL WITH CORRUGATED METAL PIPE															
L	PIPE DIA.	SINGLE PIPE						DOUBLE PIPE							
		15"	18"	24"	30"	36"	42"	48"	15"	18"	24"	30"	36"	42"	48"
C. BARS	x	x	x	x	x	x	x	y	x	y	x	x	x	x	y
G QTY.	2	2	3	3	4	4	4	5	2	2	3	3	4	4	5
M QTY.	—	—	—	—	—	—	—	2	1	1	1	2	2	2	2
G QTY.	2	2	3	3	4	4	4	5	2	2	3	3	4	4	5
TOT. LBS.	9	9	14	14	19	53	62	12	12	16	19	23	73	85	

SEE NOTES

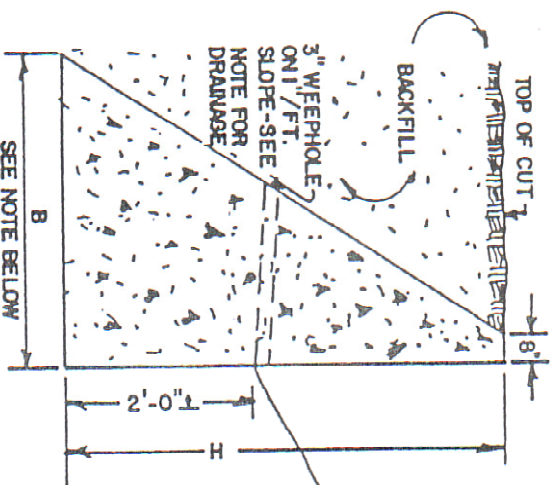
DIMENSIONS AND CONCRETE QUANTITIES																		
CONCRETE PIPE										CORRUGATED METAL PIPE								
COMMON DIMS.					SINGLE PIPE		DOUBLE PIPE			COMMON DIMS					SINGLE PIPE		DOUBLE PIPE	
D	H.	B	G	T	L	CU.YD.	M	L	CU.YD.	H	B	G	L	M	L	CU.YD.		
15	3'-4"	1'-8"	2'-9"	7/8"	5'-6"	0.734	2'-2"	7'-8"	0.970	3'-0"	1'-6"	2'-6"	5'-0"	0.573	1'-11"	6'-11"	0.780	
18	3'-7"	1'-10"	3'-2"	2"	6'-4"	0.958	2'-7"	8'-11"	1.274	3'-3"	1'-8"	2'-11"	5'-10"	0.767	2'-3"	8'-1"	1.014	
24	4'-2"	2'-1"	4'-0"	2 1/2"	8'-0"	1.506	3'-5"	11'-5"	2.010	3'-9"	1'-11"	3'-8"	7'-4"	1.200	3'-0"	10'-4"	1.997	
30	4'-9"	2'-5"	4'-7"	2 3/4"	9'-2"	2.145	4'-3"	13'-5"	2.920	4'-3"	2'-2"	4'-5"	8'-10"	1.757	3'-9"	12'-7"	2.348	
36	5'-3"	2'-8"	5'-6"	3"	11'-0"	3.040	5'-0"	16'-0"	4.086	4'-9"	2'-5"	5'-2"	10'-4"	2.456	4'-6"	14'-10"	3.288	
42	5'-10"	2'-11"	6'-4"	3 1/2"	12'-8"	4.120	5'-10"	18'-6"	5.534	5'-3"	2'-8"	5'-11"	11'-10"	3.310	5'-3"	17'-1"	4.434	
48	6'-5"	3'-3"	7'-2"	4"	14'-4"	5.535	6'-8"	21'-0"	7.427	5'-9"	2'-11"	6'-8"	13'-4"	4.337	6'-0"	19'-4"	5.812	

APPROVED: DATE May 8, 1980

STANDARD CONCRETE ENDWALL FOR SINGLE AND DOUBLE PIPE CULVERTS
15" THRU 48" PIPE - 90° SKEW

CITY OF GREENVILLE, N.C. - ENGINEERING DEPT.

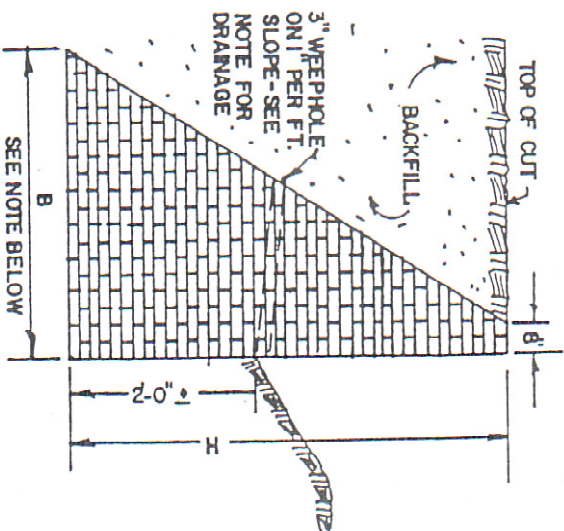
STD. NO.	REV.
30.04	



SECTION OF
CONCRETE RETAINING WALL

NOTE: THE FOLLOWING BASE WIDTHS TO BE USED.

H	B
4'-0" TO 10'-0"	4H + 8"



SECTION OF
BRICK MASONRY RETAINING WALL

GENERAL NOTES:

WEEP HOLES 3" IN DIAMETER SHALL BE PLACED AT APP. 10'-0" INTERVALS JUST ABOVE SURFACE OF EXISTING GROUND.

A STONE DRAIN CONSISTING OF 1 CUBIC FOOT OF NO. 11 OR NO. 13 STONE CONTAINED IN A BAG OF POROUS FABRIC SHALL BE PLACED AT EACH WEEP HOLE. SUBDRAIN FINE AGGREGATE SHALL BE PLACED AROUND, AND OVER THE STONE DRAIN IS COVERED BY A LAYER OF SUBDRAIN FINE AGGREGATE AT LEAST 1' THICK. A HORIZONTAL DRAIN OF SUBDRAIN FINE AGGREGATE AT LEAST 1' SQUARE IN CROSS SECTION SHALL BE PLACED TO CONNECT ALL STONE DRAINS. A VERTICAL DRAIN OF SUBDRAIN FINE AGGREGATE AT LEAST 1' SQUARE IN CROSS SECTION SHALL BE PLACED AT EACH WEEP HOLE TO AN ELEVATION 2' BELOW SURFACE OF EMBANKMENT. CLASS "A" CONCRETE TO BE USED THROUGHOUT FOR CONCRETE RETAINING WALL. IN CONCRETE RETAINING WALL, 1/2" EXPANSION JOINT EVERY 25'.

REVISIONS

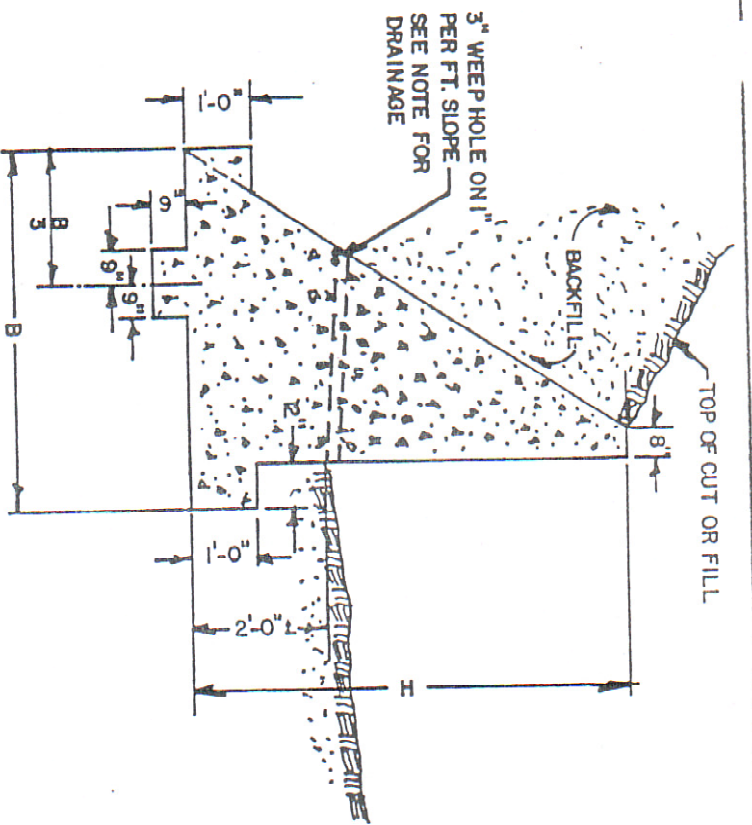
NO.	DATE	DESCRIPTION

STANDARD DETAILS FOR CONCRETE AND BRICK RETAINING WALLS.
WITH NO SURCHARGE

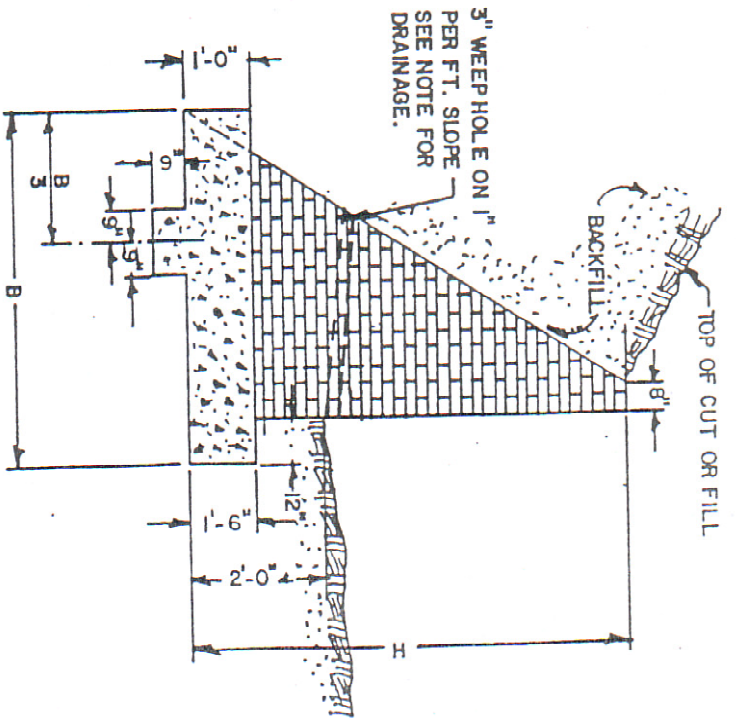
CITY OF GREENVILLE, N.C.—ENGINEERING DEPT.

APPROVED: DATE May 8, 1980

STD. NO.	REV.
30.05	



SECTION OF
CONCRETE RETAINING WALL



SECTION OF
BRICK MASONRY RETAINING WALL

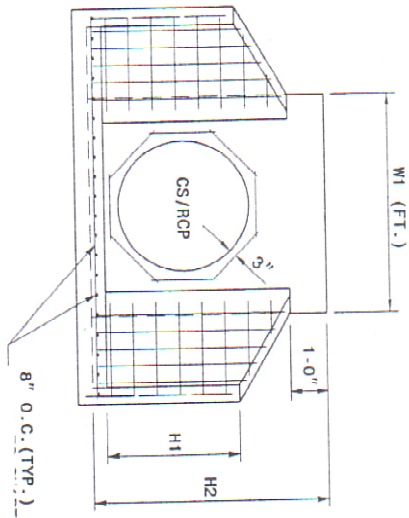
H	B
4' TO 6'	.5H + 1'-0"
6' TO 10'	.65H + 1'-0"

NO.	DATE	DESCRIPTION

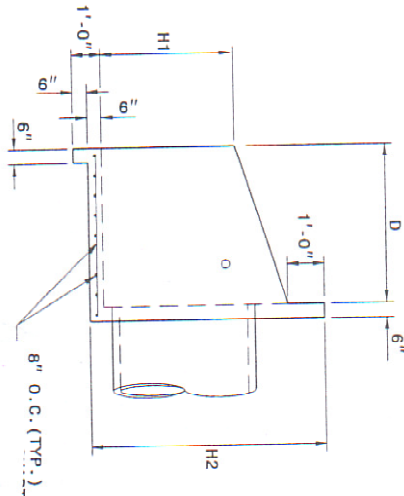
GENERAL NOTES:
 WEEP HOLES 3" IN DIAMETER SHALL BE PLACED AT ABOUT 10'-0" INTERVALS JUST ABOVE THE EXISTING GROUND.
 A STONE DRAIN CONSISTING OF 1 CUBIC FT. OF NO. 11 OR NO. 13 STONE CONTAINED IN A BAG OF POROUS FABRIC SHALL BE PLACED AT EACH WEEP HOLE. SUBDRAIN FINE AGGREGATE SHALL BE PLACED BENEATH, AROUND, AND OVER THE STONE DRAIN SO THAT DRAIN IS COVERED BY A (1") LAYER OF SUBDRAIN FINE AGGREGATE. A HORIZONTAL DRAIN OF SUBDRAIN FINE AGGREGATE AT LEAST (1') SQUARE IN CROSS SECTION SHALL BE PLACED TO CONNECT ALL STONE DRAINS. A VERTICAL DRAIN OF SUBDRAIN FINE AGGREGATE AT LEAST (1') SQUARE IN CROSS SECTION SHALL BE PLACED AT EACH WEEP HOLE AT AN ELEVATION (2') BELOW THE SURFACE OF THE EMBANKMENT.
 CLASS "A" CONCRETE TO BE USED FOR CONCRETE RETAINING WALLS, AND FOOTING FOR BRICK RETAINING WALLS.
 1/2" EXPANSION JOINT TO BE PLACED AT (25') INTERVALS IN CONCRETE RETAINING WALL.

APPROVED: DATE May 8, 1980

NEW



ELEVATION



SIDE

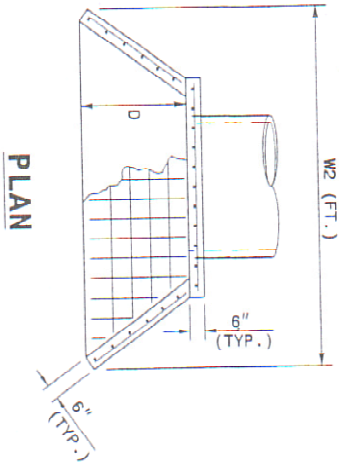
NOTES:

- * USE 4000 PSI CONCRETE.
- * PROVIDE ALL REINFORCING STEEL WHICH MEETS ASTM A615 FOR GRADE 60 AND WELDED WIRE FABRIC CONFORMING TO ASTM A185 WITH 2" MIN. CLEARANCE.
- * PLACE LIFT HOLES OR PINS IN ACCORDANCE WITH OSHA STANDARD 1926.704.
- * PIPE TO BE GROUTED INTO HEADWALL AT JOB SITE BY CONTRACTOR.
- * ALL ELEMENTS PRECAST TO MEET ASTM C913.
- * WELDED WIRE FABRIC MAY BE SUBSTITUTED FOR REBAR AS LONG AS THE SAME AREA OF STEEL IS PROVIDED.
- * CHAMFER ALL CORNERS 1" OR HAVE A RADIUS OF 1".

NOTE: THE MINIMUM BAR SIZE SHALL BE #5 BARS AT 8" CTS. THE CONTRACTOR WILL HAVE THE OPTION TO INCREASE THIS BAR SIZE AS NEEDED.

ENDWALL DIMENSIONS

FT.	MINIMUM	MIN./MAX.	MIN./MAX.	MIN./MAX.	MIN./MAX.	MIN./MAX.
PIPE DIA.	BAR SIZE	H1 (FT.)	H2 (FT.)	D (FT.)	W1	W2
1.0	#5 @ 8"	1.25/2.00	2.00/3.75	1.25/1.75	3.00/3.75	5.50/6.00
1.25	#5 @ 8"	1.25/2.00	3.00/3.75	1.25/2.00	3.50/3.75	6.50/6.75
1.50	#5 @ 8"	1.25/2.00	3.00/4.25	1.50/2.50	3.50/3.75	6.50/6.75
2.0	#5 @ 8"	1.50/2.50	4.00/4.75	1.75/2.50	4.00/4.25	7.50/8.25
2.5	#5 @ 8"	2.50/3.50	4.00/6.00	2.00/3.00	4.50/5.50	10.00/11.50
3.0	#5 @ 8"	3.00/3.50	5.00/6.00	2.75/3.50	5.25/5.75	11.50/11.75
3.5	#5 @ 8"	3.25/4.50	6.00/6.75	3.25/3.50	6.00/6.75	12.00/13.25
4.0	#5 @ 8"	3.50/4.50	6.50/7.00	3.25/3.50	6.50/6.75	13.00/13.25
4.5	#5 @ 8"	4.00/5.00	6.50/8.50	3.25/4.00	7.00/9.25	13.50/15.75
5.0	#5 @ 8"	4.50/5.00	7.00/8.50	3.25/4.00	7.25/9.25	13.75/15.75
5.5	#5 @ 8"	4.50/5.00	7.50/8.50	3.25/4.00	7.25/9.25	14.00/15.75
6.0	#5 @ 8"	4.50/5.00	7.50/8.50	3.25/4.00	7.75/9.25	14.75/16.75



PLAN

PRECAST CONCRETE ENDWALL
FOR SINGLE 12" THRU 72" PIPE - 90° SKEW

PRECAST CONCRETE ENDWALL
FOR SINGLE 12" THRU 72" PIPE - 90° SKEW